DIGITAL COMPUTER NEWSLETTER

The purpose of this newsletter is to provide a medium for the interchange among interested persons of information concerning recent developments in various digital computer projects

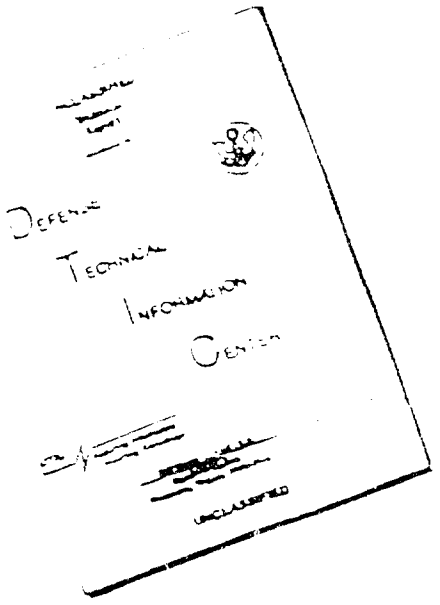
OFFICE OF NAVAL RESEARCH · PHYSICAL SCIENCES DIVISION

Vol. 8, No. 3 July 1956

TABLE OF CONTENTS

Approved by
The Under Secretary of The Navy
27 August 1951

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

COMPUTERS

BURROUGHS CORPORATION

Burroughs Corporation announces availability of the E101 Electronic Computer, contained in a cabinet the size of a normal desk. Internal memory for the E101 is identical with the magnetic drum type used in Burroughs' UDEC. Addition speed for the E101 is .002 seconds for addition of two twelve-digit numbers. Subtraction, multiplication and division are provided for in this machine.

Data is introduced into the E101 through a keyboard, and printed from the machine at speeds up to 24 characters per second. The machine automatically selects the proper columns to print answers. It is flexible as to the size and shape of the document used, and will handle up to six carbon copies. Results are immediately available in useable form.

Burroughs has set up a new research center at Paoli, Pennsylvania for prosecution of research and development work in high-speed electronics computers, specialized tubes, pulse control equipment, magnetics components and certain electronics applications in punched electric tape.

COMPUTER RESEARCH CORPORATION, of CALIFORNIA

Computer Research Corporation, Hawthorne, California announces availability of a new decimal general purpose computer, the CRC 102-D. This machine utilizes the decimal number system for entering all data, manipulating it within the machine, and printing it out. The basic proven design of the 102-A is retained in this computer but greater versatility and ease of operation have been made available through use of the decimal system. A high-speed Ferranti reader and a high-speed tape punch are also available with the computer as optional equipment.

THE RAND

The JOHNNIAC is presently being operated on a limited two day per week schedule. This is to allow for the preparation of the computer to receive a W. S. Macdonald Company magnetic drum during August, 1954 and a 4,096 word magnetic core memory from International Telemeter Corporation during October, 1954. In addition, a considerable amount of mechanical work remains to be done (e.g. dust covers) before the machine can be considered finished.

The computer has been operating on the limited schedule since March, 1954 with a 256-word Selectron memory and IBM input-output. Since the total number of B+ hours is less than 1000, no significant effective computation or down time figures are available. It can be said, however, that after a 45 minute warm-up period for the Selectron memory, the machine is usually operable and error-free for the remainder of the day.

MOORE SCHOOL DIGITAL REAL TIME SIMULATOR

The Moore School of Electrical Engineering of the University of Pennsylvania has been actively studying the feasibility of actuating an operational flight trainer using digital computers. This research, in progress for four years under sponsorship of Special Devices Center, ONR, has reached the conclusion that a digital real-time simulator of this complexity is in fact feasible.

As part of the study a graphical criterion has been developed for determining the maximum permissible quadrature interval for any specified quadrature formula. The criterion depends upon knowledge or computation of the natural frequencies of the simulated physical system. Based on this criterion, a number of non-classical quadrature formulas have been developed which are particularly attractive from the viewpoint of simulation in real time.

An ultra-high-speed digital computer has been designed using conventional diode switching pyramids (OR-AND-OR) and power-amplifier tubes. The computer utilizes synchronous serial circuits with transmission over many wires in a sequential fashion. Computing times are 5 microseconds for addition, 10 microseconds for multiplication of two 20-bit numbers. Drawings for the entire simulator, including encoding and decoding equipment, are nearing completion.

MONROBOT ELECTRONIC CALCULATORS

The MONROBOT Corporation, Morris Plains, New Jersey, is a subsidiary of the Monroe Calculating Machine Company of Orange, New Jersey. Electronic calculators based on the MONROBOT VI and MONROBOT-MU design are currently available.

MONROBOT VI SPECIFICATIONS

Input: Keyboards and punched tape and card readers are used for the entry of numbers or instructions.

Computation and control: Arithmetic Speeds (minimum)
Addition and subtraction: 7-1/2 per second
Multiplication and division: 1-2/3 per second.

Storage: Magnetic drum stores 200 words which are usually distributed as 100 twenty decimal digit numbers with algebraic sign and centrally located decimal point, and 200 operational orders. Additional storage facilities are available.

Output: Printed copy at 10 characters per second; punched tape or cards at 10 to 20 characters per second.

MONROBOT-MU (Multiple Unit) SPECIFICATIONS

Input: Keyboards, magnetic tape units, and punched tape and card readers may be used for input of instructions or alpha-numeric data.

Computation and control: Arithmetic Speeds (average)
Addition and subtraction: 40 to 125 per second
Multiplication and division: 10 to 15 per second.
The design permits simultaneous input, calculation, and output operations.

Storage: Magnetic drum storage ranges from one thousand to tens of thousands of words. Number-words are 24 decimal digits, or an equivalent number of alphanumeric characters, with sign and arbitrarily located decimal point. Order-words contain two or more operational orders.

Output: Printed copy, punched tape and punched cards and magnetic tape at varying rates depending upon the output units used.

All MONROBOTS utilize MAID (MONROBOT Automatic Internal Diagnosis) and dual arithmetic-control units for automatic checking and maintenance procedures.

ELECOM

Electronic Computer Division, Underwood Corporation, Long Island City, New York announces the following recent activities:

ELECOM model 120 electronic computer number one was delivered to Shell Oil, Houston, Texas, in April, 1954. The number two ELECOM 120 was delivered to Westinghouse, Philadelphia, in May. Both machines have been installed and have passed their acceptance tests.

The number one ELECOM 120 acceptance test used variable data, tested all memory positions, both magnetic tape and drum, and all instructions. The test ran for 16 hours, and the only minor mishap was a missed bit on the Flexowriter paper tape input read-in. The test for the number two machine was of the same general variety, lasted for 26 hours, and included a typical Westinghouse problem as part of the test.

The ELECOM 200, designated the 'ORDFIAC' by the Army Ordnance Corps, passed its acceptance tests at the ELECOM factory on April 16, 1954. The test involved 50 hours of 'ORDFIAC' running time, and was of the leapfrog variety, testing all memory positions and all instructions. During the 50 hours, 1 major and 6 minor errors were recorded. The test period included 20 hours of continuous test time without error. Delivery of the 'ORDFIAC' to Letterkenny Arsenal, Chambersburg, Pennsylvania, is expected to take place in late June or early July.

ELECOM 120 number three, now under construction for Republic Aviation, will include several of the new features offered in conjunction with the ELECOM 120 computer. Internal memory capacity will be 2,000 instead of the standard 1,000 words. Also, this machine will have built-in floating decimal operation. Delivery is expected early this summer.

Number four ELECOM 120, a standard 1,000 word computer with two magnetic tape units, is scheduled for delivery to Griffiss Air Force Base, Rome, New York, in approximately three months.

UNIVAC

The Metropolitan Life Insurance Company began installing Remington Rand's famous UNIVAC electronic data processing system in its home office at 1 Madison Avenue, New York, on Thursday, April 22, 1954. It is the first installation of UNIVAC in the insurance business.

Decision to install the UNIVAC, according to Frederick W. Ecker, president of Metropolitan Life, followed a study over several years by a committee of company officials looking into economies of operation which could be achieved in behalf of the Metropolitan's 37,000,000 policyholders in the United States and Canada.

"Suitability of the device to our use is based to a large extent upon the advantages of a large, centralized operation," Mr. Ecker commented. "It is clearly indicated that equipment of this general type affords the possibility of substantial economies in performing many of our basic home office operations."

The installation will deal with assemblying and analyzing actuarial statistics arising from the millions of transactions affecting the company's policyholders. Procedures for the employment of the UNIVAC already have been set up. The central computer will be operated on two shifts for five days a week.

The Metropolitan committee which studied the use of the system is under the chairmanship of Malvin E. Davis, vice-president and chief actuary. Mr. Davis also is chairman of the industry-wide Society of Actuaries committee on the application of large scale electronic equipment to life insurance work.

"The installation will handle work which has been done by what were previously considered the most up-to-date mechanized methods," Mr. Davis commented. "A great volume of routine work can be eliminated. Employees who have been engaged in such work can be released for other more interesting company assignments."

The decision to acquire and install the UNIVAC by the Metropolitan was prompted by such major considerations as:

1. The fact that any electronic data processing system should be inherently so accurate that a negligible amount of clerical trouble shooting and control routines would be required. The UNIVAC, with its parity checks and built-in duplicate arithmetic units, assures complete accuracy of results.

2. The fact that the UNIVAC is completely compatible with punched-card systems (conversion to and from punched-cards), and that a UNIVAC is in operation at Remington Rand's Computing Center in New York. These two factors are assurance that unusual peak loads could always be handled without an interruption of schedules.

3. The fact that the UNIVAC operates with a magnetic metallic tape for more permanent recording and more trouble-free operation.

4. The fact that the investment in computer equipment was justified in the expectation of a fairly long-term use, and was therefore, more properly applicable to equipment such as the UNIVAC which could be purchased rather than only rented.

As the full potential of the UNIVAC is developed, its initial use for actuarial investigations and reports will be expanded to include such operations as policy settlement work, file keeping, regular policy services, and other office and administrative functions.

MIDAC/MIDSAC

THE MIDAC (University of Michigan Digital Automatic Computer)

MIDAC is now in its second year of operation. During the six-month period prior to January 1954 approximately 780 hours were used by MIDAC of which 70% of the total scheduled time was productive. In the four-month period from January up to issuance of this report this percentage had risen to 73%.

In that six-month period, 26 major problems were coded, formulated, or under investigation for solution on MIDAC. These problems originated from Willow Run Research Center, the University of Michigan Departments, governmental agencies, research groups, and private industry. In addition over 41 problems have been solved by members of the MIDAC staff as general utility programs.

Some of the problems undertaken were a problem in missile simulations, optical ray tracing, expansion of the subroutine library, solution of a problem in light diffusion, de-icing of aircraft, Jacobi Method in obtaining eigenvalues of a matrix, numerous problems in data reduction, design of a traveling-wave tube amplifier, matrix operations, and a floating point interpretive routine. To date 19 subroutines have been completed and checked out and an additional 18 are in the process of being coded.

One of the mathematical investigations made was the development of approximations to standard functions using Tchebycheff equal-ripple polynomials. Plans are for the computer to generate the approximations. The investigation of a proposed method for obtaining all roots of polynomials at once and methods for determining eigenvalues and eigenvectors to extend present methods to the non-symmetrical case were also studied.

The computational scheme of the MIDAC has been to integrate all standard operating and programming procedures into one automatic system, called Michigan Automatic General Integrated Computation (MAGIC). Several parts of this system have been completed. A revised interim "Input Translation Program" using floating addresses is now in use. The revised I. T. P. program provides for coding of instructions and numbers from an external decimal-algebraic language into internal machine binary language. This is more expedient than the pure hexadecimal input. In the final system, translated results and utility programs are to be stored on the magnetic drum instead of on the punched paper tape. Eventually the functions performed by the magnetic drum will be accomplished by magnetic tape.

The input-output system has been improved. The original MIDAC system would accept only the sixteen true hexadecimal characters. Now the input-output system is adjusted to handle single-character input and output. The original system consisted of only a Flexowriter reader and printer. Two high-speed Ferranti photoelectric readers have now been added.

Members of the digital computation department have conducted classes and seminars at the University of Michigan. "Methods in High Speed Computation" (Math. 173-174), a two-semester graduate course, was given during 1953-54 and included instruction in automatic digital computer characteristics, programming, and numerical methods for use with high-speed digital computers. A course in "Digital Computers" (E.E. 238) was given the second semester. Individual members of both classes solved problems on the MIDAC.

The Association for Computing Machinery Conference is scheduled to be held at the University of Michigan during June 23, 24, and 25 under the direction of the Digital Computation Department. Over 100 technical papers are to be presented during the sessions.

A special two-week summer session titled "Digital Computers-Their Coming of Age" will be given from August 2 to August 13. MIDAC will be used as the laboratory machine for course members. Topics to be emphasized are programming and formulation, numerical analysis, applications, and evaluation of existing commercial computers. This special course is aimed at people interested in engineering and scientific computations, business and industrial inventory and accounting procedures, real time process control, and simulation of large data-handling control systems. The course will assist members in determining the applicability of computing machines to their specific industrial problems.

The Digital Computation Department has accumulated an appreciable amount of literature pertaining to digital computation. A bibliography is available to interested groups on request.

THE MIDSAC (The University of Michigan Digital Special Automatic Computer)

The MIDSAC, now operative at the Willow Run Research Center, is a special purpose electronic computer designed to operate as a real time element in automatic control systems. Special inputs and outputs accommodate both digital and analog real time data. The principle engineering characteristics of this machine are:

Instruction Form	3 address
Word Length	31 bits
Operation Code	add, subtract, multiply, divide, compare absolute, compare algebraic, base, file, and 3 transfer orders
Storage	Rapid access (Williams Tube Memory) 31 CRT's operated in parallel, 256 bits/tube, 8 ms cycle Medium access (Magnetic Drum) 4 sets of 244 instructions 17 millisec. access time
Arithmetic Unit	Serial - parallel type
Rate of Arith. Operations	(the required 4 accesses to memory are included) Additions or Subtractions/sec. - 25,000 Multiplications/sec. - 11,400 Division/sec. - 3,680
Components	1 Mc. Dynamic Type Circuitry 1200 vacuum tubes 18,000 crystal diode
Auxiliary input-output	Flexowriter typewriter

RAYDAC

The Computer Control Co., Inc. of Belmont, Massachusetts has contracted with the Bureau of Aeronautics to operate, maintain and provide the mathematical services for the RAYDAC, a high speed digital computer now located at USNAMTC at Point Mugu, California. The machine is now operating on a one shift basis solving problems originating at USNAMTC, other military facilities and contractors to the Department of Defense. Machine time and coding time is available.

ELECTRO DATA CORPORATION

Further details on the ElectroData Corporation computer mentioned in the April, 1954 Newsletter are given by the Corporation as follows:

The computer operates in the fixed point decimal system, using binary coded decimals, and is decimal in input and output. Each word includes 10 decimal digits plus sign. This obviates the necessity of converting from binary to decimal modes and vice versa. The four binary digits are operated on in parallel; each successive decimal digit is handled serially. A powerful set of about 50 commands make up the computer logic. The logic is distinguished by the B-register which enables you to modify a command, just before execution, by the contents of the B-register without changing the command in memory. This facilitates iterative procedures by allowing automatic incrementing of addresses during instruction interpretation.

Our drum memory contains 4080 words including four quick access loops of 20 words each. All memory positions are addressable. The drum revolves at 3500 rpm giving you an average access time of about 8.5 milliseconds for the 4000 words main memory. Access time in the fast loops, however, is only .85 milliseconds. By blocking commands and numbers in groups of 20 to the quick access loops, the computer is able to attain an average speed of about 400 operations per second.

The input-output system includes input from a high speed photoelectric tape reader which can read punched paper tape at a rate of about 560 digits per second. Input may also be from a slower mechanical tape reader attached to the Flexowriter cabinet or from a hand keyboard. Output may be to a separate tape perforator perforating at the rate of approximately 12 decimal digits per second, or to another mechanical tape perforator attached to the Flexowriter, or directly to printed data via the Flexowriter. The Flexowriter has external format controls for tabulation of the data in any form desired, or the format may be coded and controlled by the computer. Also alpha-numeric output is possible on the Flexo-writer through proper coding. The Flexowriter can simultaneously print the output and punch it on paper tape.

The control panel contains all controls, switches, and display registers necessary for normal operation and program checking. Also a separate display and control panel is available on the computer. Through breakpoint switches on the control panel and through coding we may read out data at any desired point in the calculation.

A library of subroutines, including floating point operations, and routines developed by our Technical Services Department is made available free of charge to all customers. This library is gathered from daily operation of our demonstration computer located here in Pasadena. Interchange of routines and subroutines developed among our customers also is encouraged.

The computer operates from a 220-volt, 60-cycle, 3-phase outlet. The maximum power consumption does not exceed 15 kw. The computer operates at normal room temperature; a maximum of only 7 kw of heat needs to be dissipated by a building or room air conditioning system. Forced air ventilation is incorporated in the computer.

The computer has been conservatively designed and constructed as to make for high reliability and easy maintenance. About 1200 tubes, contained in about 160 plug-in units, and 3000 diodes are in the computer. Space and color-coded wiring is used. A built-in test pulse system is used to test plug-in units for marginal operating conditions.

Each block of 20 words on the tape has its own address to simplify the proble any particular block. Also an odd-even check is used to check each decimal digit tape unit. The tape unit does not have to reposition in order to begin search. It ward or backward from its last read-position depending on the next address to be

The computer will stop for an unanticipated number overflow or for an unallowed combinat. on. Also an alarm will sound for an error in memory location.

ABERDEEN PROVING GROUND COMPUTERS

The ORDVAC continues to be the most used computer at the Ballistic Research Laboratories. Available machine time in excess of 100 hours, 32 different problems and 191 problem changes are weekly averages.

IBM input-output is now an integral part of the Edvac system. The same input data can now be used on either ENIAC, EDVAC, or ORDVAC.

A total of 18,000 hours of computer time have been used for the solution of problems during the fiscal year ending 30 June 1954. This figure represents an increase for the three high speed machines of nearly 1,000 hours over the previous fiscal year and again indicates an increase in the productive output of the Computing Laboratory.

THE INSTITUTE FOR ADVANCED STUDY ELECTRONIC COMPUTER PROJECT

The switching relays associated with the magnetic drum auxiliary memory to the Institute for Advanced Study machine caused considerable operating difficulties with that unit since the last report in the Newsletter. Thorough cleaning and inspection of these relays has resulted in very substantial improvement in the operating performance. The drum is now available for full-scale use.

Within the next several weeks it is anticipated that the electrical engineering group will make a modification of the accelerating voltage of the cathode ray tubes which is expected to improve the read around.

An auxiliary oscilloscopic graphing device has been designed and is under construction. It is anticipated that this will be placed under engineering test within the next quarter.

Arrangements have been completed to increase the dehumidifying and cooling capacities of the air conditioning system for the computer.

A considerable number of problems have been successfully run during the quarter and reports are now being prepared on them.

CIRCLE COMPUTER

(Nuclear Development Associates, Inc., White Plains, New York)

The acceptance requirement was that Circle Computer No. 1 operate without error for 3200 minutes (53 hrs. 20 min.) before accumulating down-time of 1600 minutes (26:40) on a series of problems that would require the performance of every operation for which the machine was designed. The test was run on nine days, from 11th May through 21st May, 1954, and showed a ratio of error-free-computation-time to total time substantially in excess of the required value of 2/3.

A total of 125 problems (of varying lengths up to 90 minutes) was correctly solved in 3204 minutes (53:24). Incorrect solutions were obtained on only 16 problems, 7 being due to computational errors and 9 to input errors, and these resulted in a time-loss of only 248 minutes (4:08). However, "down-time" was computed as the total of these computational and input errors

plus three other factors, the total being as follows:

(1) Interruptions for maintenance:	77 min.	(1:17)
(2) Computational errors (7):	163 min.	(2:43)
(3) Input errors (9):	85 min.	(1:25)
(4) Output errors (7):	86 min.	(1:26)
(5) Carriage return errors (49):	520 min.	(8:40)
Total	931 min.	(15:31)

The "carriage return errors" did not affect the accuracy of computation, since they merely caused a single line-space where a double line-space was called for. They occurred on only one of the typewriters, and it is believed that an overhaul of that machine would eliminate them. However, if they are included in "down-time," the performance ratio is as follows:

$$\frac{\text{Error-free computation time}}{\text{Total time}} = \frac{3204}{3204 + 931} = \frac{3204}{4135} = 77.5\%$$

This value is well above the ratio of 66.6% required by the purchaser as the criterion of satisfactory operation of this first Circle Computer.

A more meaningful appraisal of the high degree of computational accuracy demonstrated in the Acceptance Tests can be had by deducting from "down-time" the 520 minutes charged as "carriage return errors," and adding that figure to the error - free computation time (which in fact it was). Thus E F C T becomes 3204 + 520 = 3724 minutes (62:04) and down-time becomes 931 - 520 = 411 minutes (6:51). On this basis the performance ratio is:

$$\frac{E\,F\,C\,T}{E\,F\,C\,T + D\,T} = \frac{3724}{3724 + 411} = \frac{3724}{4135} = 90\%$$

The runs on each of the nine days of the test were as follows:

	Error-free computation time		Total Time		Performance Ratio*
May 11	462 mins.	(7:42)	508 mins.	(8:28)	91%
12	416	(6:56)	497	(8:17)	84
13	546	(9:06)	570	(9:30)	96
14	421	(7:01)	489	(8:09)	86
17	364	(6:04)	381	(6:21)	95
18	434	(7:14)	528	(8:48)	82
19	443	(7:23)	482	(8:02)	92
20	439	(7:19)	471	(7:51	93
21	199	(3:19)	209	(3:29)	95
Total	3724	(62:04)	4135	(68:55)	—

Ninety minutes of routine maintenance was scheduled before the beginning of each day's run, but less than the total was required to keep the machine in running order.

WHIRLWIND I

Applications

During the past 3 months, 20 problems were initiated by the Scientific and Engineering Computation (S&EC) Group, in conjunction with various departments at MIT, for solution on Whirlwind I; 12 problems were completed, leaving the number of active problems at 45. Reports have been written or are in the process of being written on 30 problems. These reports include a book, academic theses, laboratory technical reports, and papers to be published in scientific journals.

*These performance ratios calculated with typewriter malfunctions not included.

The comprehensive system of service routines, developed for the input conversion of suitably prepared punched paper tapes, has been expanded and improved. The revised system, called CS II, includes a faster and more flexible programmed arithmetic, increased information to aid the programmer in trouble-shooting his program, and facilities for automatic logging of computer operation. The associated input program has been rewritten to provide for the automatic selection and proper processing of binary and Flexo program tapes and post-mortem request tapes.

Systems Engineering

The amount of computer time scheduled for S&EC applications has averaged about 40 hours per week. The reports submitted by the operators show that 92 percent of the assigned time was usable during this period. This figure is the same as the average for the entire period from September 1953, when core memory replaced electrostatic memory. For the past few months the core memory has required a negligible amount of maintenance other than routine marginal checking. The parity alarms that have occurred have been spaced at intervals of a few weeks and have usually been attributable to momentary shorts in tubes associated with the memory. To the present there has been no memory failure attributable to the cores themselves.

Academic Program

Two series of seminars were conducted during the past 3 months. One series was devoted to computing-machine methods; the other, to advanced programming techniques for WWI.

Each of the 12 students enrolled in Professor C. W. Adams' MIT Course 6.537, "Digital Computer Applications Practice," has run a problem of his own choosing on WWI.

Preparations are being made for the 2 summer-session courses being offered this year. Course 6.532 on advanced coding techniques will run for 1 week beginning on 2 August. Course 6.531 on digital computers with special reference to business applications will be given from 16 August through 27 August.

COMPONENTS

INTERNATIONAL TELEMETER CORPORATION

The International Telemeter Corporation, 2000 Stoner Avenue, Los Angeles, California, has completed and put into operation an automatic machine for the individual testing and grading of ferrite cores to be included in computer memory systems. This machine is capable of testing cores at the rate of one per second, measuring both the signal resulting when the core changes its state of magnetization, and the much smaller signal resulting from a flux disturbance inadequate to reverse the magnetization of the core.

The machine was first used to test the cores intended for incorporation in the storage matrices of a memory system that Telemeter is building for the RAND Corporation of Santa Monica, California. 250,000 cores were individually tested and sorted into grades in a total time of four and one-half days. The yield of usable cores obtained by substituting the grading procedure for "go, no-go" tests has proved to be in excess of 98 per cent of the cores delivered to Telemeter by the manufacturer.

Telemeter is using the automatic grading machine to produce uniform cores needed in the construction of magnetic-core memory systems being built for the Argonne National Laboratory and for the Ballistic Research Laboratories at Aberdeen Proving Ground. However, the capacity of Telemeter's storage-core grading machine is so high that custom grading of storage cores for other users can be arranged.

HUGHES AIRCRAFT COMPANY

The Hughes Aircraft Company is currently developing a complete line of data processing equipment. The various items being developed will include a digital computer having a large size magnetic tape memory, high speed punched paper tape and punched card reading devices, and a high speed printer using magnetic tape inputs. The first item to be completed will be the printer which will have the following characteristics:

> Printing rate in excess of 1[illegible] lines per second with 60 different printable characters and with quality comparable with that of typewritten copy.
>
> Can be supplied to print from 30 to 180 columns in units of 30 columns.
>
> The paper feed mechanism will pass over non-printed areas at 6 times the printing rate.

SOROBAN

Two years ago, the design and development of a new and improved high-speed large-scale digital computer (FLAC) was initiated at the Air Force Missile Test Center, Patrick Air Force Base, Florida. The machine is now operational, and the resources of the same group which designed and constructed it are being made available through Soroban Engineering, Inc. It is the intent of this company to continue to develop and manufacture high-speed electronic digital computers and associated components. Particular emphasis is being placed on computer auxiliaries (i.e. high-speed tape punches and readers, data preparation and presentation devices, high-speed magnetic tape units, etc.).

One of the first items Soroban is offering commercially is the Model FK-104 Coded Automatic Keyboard. This is but one of several components which Soroban feels are urgently required by the digital computer industry.

NOTICE

DCN NEWS ITEM

This Newsletter is being republished in the Proceedings of the Association of Computing Machinery. These Proceedings may be obtained from the Association of Computing Machinery, 2 East 63rd Street, New York, New York.